MAYO CLINIC LABORATORIES

Test Definition: VITC

Ascorbic Acid (Vitamin C), Plasma

Overview

Useful For

Identifying vitamin C deficiency

Method Name

Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)

Portions of this test are covered by patents held by Quest Diagnostics

NY State Available

Yes

Specimen

Specimen Type

Plasma Heparin

Shipping Instructions

Ship specimen frozen on dry ice in amber vial to protect from light.

Specimen Required

Patient Preparation:

Fasting: 12 hours, required; infants should have specimen collected before next feeding

Supplies: Amber Frosted Tube, 5 mL (T915)

Collection Container/Tube:

Preferred: Green top (sodium or lithium heparin) (plasma gel/PST are not acceptable)

Submission Container/Tube: Amber vial

Specimen Volume: 1 mL Plasma

Collection Instructions:

1. Immediately place specimen on wet ice and process within 2 hours of collection.
2. Centrifuge at 4 degrees C, aliquot plasma into amber vial to protect from light.
3. Freeze plasma immediately, ideally at or below -60 degrees C, protected from light.

Forms

If not ordering electronically, complete, print, and send General Request (T239) with the specimen.

Specimen Minimum Volume

Plasma: 0.5 mL

Reject Due To

Hemolysis	Reject

Gross lipemia	OK
Gross icterus	OK
Not light protected	Reject

Specimen Stability Information

Specimen Type	Temperature	Time	Special Container
Plasma Heparin	Frozen	14 days	LIGHT PROTECTED

Clinical & Interpretive

Clinical Information

Vitamin C, also known as L-ascorbic acid or simply ascorbic acid, is a water-soluble vitamin that is naturally present in some foods, added to others, and available as a dietary supplement. Humans, unlike most animals, are unable to synthesize vitamin C endogenously, so it is an essential dietary component. Vitamin C is required for the enzymatic amidation of neuropeptides, production of adrenal cortical steroid hormones, promotion of the conversion of tropocollagen to collagen, and metabolism of tyrosine and folate. It also plays a role in lipid and vitamin metabolism and is a powerful reducing agent or antioxidant. Specific actions include activation of detoxifying enzymes in the liver; antioxidation, interception and destruction of free radicals; preservation and restoration of the antioxidant potential of vitamin E; and blockage of the formation of carcinogenic nitrosamines. In addition, vitamin C appears to function in a variety of other metabolic processes in which its role has not been well characterized.

Prolonged deficiency of vitamin C leads to the development of scurvy, a disease characterized by an inability to form adequate intercellular substance in connective tissues. This results in the formation of swollen, ulcerative lesions in the gums, mouth, and other tissues that are structurally weakened. Early symptoms may include weakness, easy fatigue and listlessness, as well as shortness of breath, and aching joints, bones, and muscles.

The need for vitamin C can be increased by the use of aspirin, oral contraceptives, tetracycline, and a variety of other medications. Psychological stress and advancing age also tend to increase the need for vitamin C. Among older adults, lack of fresh fruit and vegetables often adds vitamin C depletion to the inherently increased need, with development of near-scurvy status.

Reference Values

0.4-2.0 mg/dL

Interpretation

Values below 0.2 mg/dL indicate significant deficiency.

Values greater than or equal to 0.2 mg/dL and less than 0.4 mg/dL are consistent with a moderate risk of deficiency due to inadequate tissue stores.

Values of 0.4 to 2.0 mg/dL indicate adequate supply.

The actual level at which vitamin C is excessive has not been defined. Values above 3.0 mg/dL are suggestive of excess intake. Whether vitamin C in excess is indeed toxic continues to be uncertain. However, limited observations suggest that this condition may induce uricosuria and, in individuals with glucose-6-phosphate dehydrogenase deficiency, may induce increased red blood cell fragility.

Cautions

Testing of nonfasting specimens or the use of vitamin supplementation can result in elevated plasma vitamin concentrations. Reference values were established in patients who were fasting.

After consuming vitamin C, plasma values rapidly rise within 1 to 2 hours and reach peak concentration within 3 to 6 hours after ingestion.

The presence of hemolysis with hemoglobin concentrations of 100 mg/dL or greater results in falsely decreased vitamin C values. Samples visually classified by the laboratory as hemolyzed will be rejected and testing will be cancelled.

Clinical Reference

1.Vitamin C toxicity. Nutr Rev. 1976;34(8):236-237. doi:10.1111/j.1753-4887.1976.tb05776.x 2
2. Moser U, Bendich A. Vitamin C. In: Machlin LJ, ed. Handbook of Vitamins. 2nd ed. Marcel Dekker; 1991:195-232
3. Ball GFM. Vitamins: Their Role in the Human Body. Blackwell Publishing; 2004:393-420
4. Zlatuse DC, Frank EL. Development and implementation of an HPLC-ECD method for analysis of vitamin C in plasma using single column and automatic alternating dual column regeneration. Prac Lab Med. 2016;6:25-37. doi:10.1016/j.plabm.2016.09.001
5. Sodi R. Vitamins and trace elements. In: Rifai N, Chiu RWK, Young I, Burnham CAD, Wittwer CT, eds. Tietz Textbook of Laboratory Medicine. 7th ed. Elsevier; 2023:417

Performance

Method Description

Samples are diluted and extracted online extraction by high-turbulence liquid chromatography, with detection by tandem mass spectrometry.(Unpublished Mayo Method)

PDF Report

No

Day(s) Performed

Monday through Friday

Report Available

3 to 5 days

Specimen Retention Time

2 weeks

Performing Laboratory Location

Mayo Clinic Laboratories - Rochester Superior Drive

Fees & Codes

Fees

- Authorized users can sign in to Test Prices for detailed fee information.
- Clients without access to Test Prices can contact Customer Service 24 hours a day, seven days a week.
- Prospective clients should contact their account representative. For assistance, contact Customer Service.

Test Classification

This test was developed and its performance characteristics determined by Mayo Clinic in a manner consistent with CLIA requirements. It has not been cleared or approved by the US Food and Drug Administration.

CPT Code Information

82180

LOINC® Information

Test ID	Test Order Name	Order LOINC® Value
VITC	Ascorbic Acid, P	1903-4

Result ID	Test Result Name	Result LOINC® Value
8312	Ascorbic Acid, P	1903-4